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THE WORLD CONSTRUCTED PART III: CHARTING THE WATERS

An Exhibition of Maps

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CHARTING THE WATERS

I. The Expanding Ocean Sea

II. Islands, Real and Imagined

III. Currents and Winds

IV. Longitude

V. Magnetic Variation

VI. The Mercator Chart

VII. Charting the Coastlines

VIII. Water Roads to the Interior

I. The Expanding Ocean Sea

According to Greek legend, *Oceanus* was the river that encircled the inhabited world. Beginning its course at the setting sun, it passed the columns of Hercules and washed the borders the Elysian Fields and Hades. Monsters and outlandish peoples inhabited its edges, where reality ended and the fabulous began. After about 630 B. C., expeditions outside the Straits of Gibraltar by Greek and Phoenician mariners and explorations of the Red Sea and Persian Gulf by Darius I demonstrated that the legendary *Oceanus* was in reality a salt water "ocean" indented with seas. As the sphericity of the earth began to be recognized in about 350 B. C., geographers conjectured that eastern Asia might be reached by sailing west from Europe, and in 120 B. C. there was an unsuccessful attempt to circumnavigate Africa.

Although the Ancients were unable to prove that a continuous ocean surrounded the habitable world, geographers were challenged to examine its various theoretical parts. Claudius Ptolemy (fl. 2d. cent.) proposed that what we call the Indian Ocean (Mare Indicum) was not part of the larger ocean at all, but was instead a land-locked sea.

a continuous ocean surrounded the habitable world, geographers were challenged to examine its various theoretical parts. Claudius Ptolemy (fl. 2d. cent.) proposed that what we call the Indian Ocean (Mare Indicum) was not part of the larger ocean at all, but was instead a land-locked sea. Others suggested that the southern part of the ocean contained another continent, while it was generally accepted that in its northern reaches it was too frozen, shallow, or "glutinous" for navigation. The western ocean, on the other hand, was supposed to contain many islands, but sailing was hazardous because it was shallow, weed-choked, and infested with sea monsters.

1.

Mappamundi. In: Jacopo Phillipo da Bergamo, [SUPPLEMENTUM CHRONICARUM.] Venice, 1486.

The earth is surrounded by the ocean and its inhabitants on this mappamundi depicting the Christian cosmos. God has created Adam and Eve and the animals of land and air and has placed them in the Garden of Eden at the earth's center.

2.

Magnus Olaus, HISTORIA DE GENTIBUS SEPTENTRIONALIBUS. Rome, 1555.

3.

Hartmann Schedel, DAS BUCH DER CRONIKEN UND GESCHICHTEN. Augsburg, 1499.

These illustrations show some of the monsters and misfits that were thought to inhabit the ocean and its far shores.

4.

[Claudius Ptolemy, *World map*. Rome, ca. 1480; restrike Rome, ca. 1590].

This world map presents the Ptolemaic view of a land-locked Mare Indicum, not considered as part of the encircling Ocean. The Mare Atlanticum (along the northwestern coast of Africa) is a local sea, an indentation of Oceanus Occidentalis. The name, Atlantic, was not derived from the legendary island of Atlantis, but from the Atlas mountains of Africa, which were considered one of the boundaries of the habitable world. Although there are some inconsisten-

cies, this map gives a good idea of how a fifteenth-century cartographer used the terms ocean (oceanus), sea (mare, mer), and bay (sinus).

5.

World map. In: Claudius Ptolemy, GEOGRAPHIA. Venice, 1511.

On this traditionally Ptolemaic world map the cartographer has introduced some uncertainty about the "closed" or "open" nature of the Indian Ocean by the way he has arranged the landmasses on his sheet of paper. Nonetheless, Oceanus Occidentalis remains a western border.

6.

Claudius Ptolemy, *Orbis Typus Universalis*. [Nuremberg, ca. 1507-1513.]

The earth's landmasses seem to float in an ocean without boundaries on this map, which was probably made about 1507. It reflects the first glimpses of an expanded world as it was revealed by the Columbian westward voyages. Here, for the first time, Oceanus Occidentalis sheds its traditional role as a belt of water surrounding the European world.

7.

Willem Blaeu, *Nova Totius Terrarum Orbis*. Amsterdam, [ca. 1635.]

This map is a cartographic view of the world and its oceans as seen by Europeans in the seventeenth century, when Dutch trading ships were masters of the sea and Dutch publishers were masters of the European map and chart trade. Willem Blaeu's large, but imaginary, southern landmass is a mixture of ancient legend and contemporary geographical theory, cemented with odd bits of information reported by mariners and explorers. In the north, uncertainty about the nature of the frozen land and water makes his depiction of ocean circulation rather vague. In contrast to the previous map, it is plain that new lands in the expanded ocean are an impediment to unrestricted world travel by water.

The Mare Atlanticum creeps north and west, as it has been in the process of doing since the late sixteenth century. What we now call the North Atlantic, however, was most often designated the Northern or Western Ocean until well into the nineteenth century, while the South Atlantic was most often named the Ethiopic Ocean.

8.

Bowles's New One Sheet Chart of the Atlantic or Western Ocean. London,

[ca. 1794.]

By the end of the eighteenth century, sailing routes between Europe and North American ports had created busy roadways across the North Atlantic.

II. Islands, Real and Imagined

Europeans had long been interested in islands, not least for their legendary reputation as sources of wealth. This interest was reflected in the *isolario*, or island-atlas, which developed in Italy during the fifteenth and sixteenth centuries as an illustrated guide for travelers. As the known world expanded, newly-discovered islands such as those in the the West Indies comfortably found a place in this established genre.

Cartographers of the Middle Ages had inherited a vague tradition of the existence of islands off the coast of Africa, but information about those Atlantic islands was often confused and interwoven with legend. As the Azores, the Madeiras and the Canaries became better known and settled by Europeans, the legendary islands tended to move west once again to the borders of "civilization." Sorting out the real from the imaginary was problematic for cautious chart publishers who were reluctant to remove dubious landmasses from their maps in case some hazard to navigation might exist after all.

9.

Bartolomeo da li Sonetti, [ISOLARIO.] Venice, 1532.

Bartolomeo dalli Sonetti's description of islands in the Mediterranean, initially published in Venice about 1485, was the first printed *isolario*. The islands are unnamed, but they are described in verse below the woodcuts.

10.

Descrittione della Gran Citta e isola Temistitan. In: Tomaso Porcacci da Castiglione, L'ISOLE. Venice, 1572.

In Porcacci's *isolario*, New World islands join those of the Old World. Tenochtitlan, the Aztec capital (now Mexico City), is included because it was an island in the middle of Lake Texcoco.

11.

St. Brendan saying mass on the back of a giant fish. In: Honorius Philoponus, NOVA TYPUS TRANSACTA NAVIGATIO. Linz, 1621.

The historic St. Brendan was born in the fifth century A. D. in southwest Ireland. After his ordination he at-

tracted a group of disciples and began to travel by boat to islands in the North Atlantic, earning the name,"Brendan the Voyager." Over the centuries a literature called the *Narratio* grew up about St. Brendan and his lifetime of travels and, while the text is actually a metaphoric description of the soul's journey to the Promised Land, it was so successful in integrating realism with fantasy that geographers attempted to locate each of the islands it described. Because St. Brendan's earthly paradise was supposed to have a warm and pleasant climate, it was traditionally placed off the coast of Africa. As European colonization of the Canaries, the Madeiras, and the Azores progressed and no Promised Land was revealed, cartographers began to locate the island further west. On the Ortelius map of 1574 (No. 16), the island of St. Brendan is off the coast of Newfoundland—hardly the balmy climate of legend. The illustration shown here depicts Brendan saying mass on the back of a large fish that he and his followers had mistaken for an island.

12.

Johann Ruysch, *Universalior cogniti orbis tabula.* In: Claudius Ptolemy, GEOGRAPHIA. Rome, 1508.

After the fall of the Goths in the eighth century, seven Spanish bishops and their followers fled to an island far out in the Western Ocean that they called Antillia, where they founded seven cities. Stories about the island circulated in the ports and intellectual centers of Europe and many unsuccessful searches were launched. The first known representation of Antillia is on a manuscript nautical chart dated 1424; thereafter it appeared regularly, a large rectangular island always located west of the Azores. The island remained elusive, but the name gradually came to be associated with the Caribbean West Indies as the Greater and Lesser Antilles. It has been suggested that the eighth-century bishops may actually have settled on São Miguel in the Azores—as this real island group became well-known to Europeans the legendary Antillia had to move west into the unknown sea. On this map, the island lies right of center, just to the west of the Azores.

13.

Nicolo Zeno, DEI COMMENTARII DEL VIAGGIO IN PERSIA...ET DELLO SCOPRIMENTO DELL'ISOLE FRISLANDIA, ESLANDA, ENGROUELANDIA, ESTOTILAND, & ICARIA. Venice, 1558.

14.

Nicolo Zeno, FRISLAND. [Venice, ca. 1570.]

A number of claims have been made for pre-Columbian voyages to the Americas. The Venetian brothers Antonio and Niccolò Zeno supposedly sailed westward across the North Atlantic in about 1390 and were shipwrecked on "Frisland" where they claimed to have lived for some years. Eventually they returned to Venice where their documents remained in the family until a descendent published them in 1558. The story has been a subject of controversy from its first appearance, and many historians have dismissed the account as fictitious. However, recent studies have suggested the the Zeno brothers actually did make a voyage, and their Frisland has been identified with the largest of the Färoe Islands. The lands that appear at

the lower left—Icaria, Estotiland, and Drogeo—may well be hints of the Labrador landfalls of several Norse voyages to North America that began in the tenth century. Abraham Ortelius gives their story the benefit of the doubt and includes the Zeno lands on his map of 1574 (No. 16).

15.

[New France.] In: Giovanni Battista Ramusio, NAVIGATIONI ET VIAGGI. Venice, 1556.

It was reported by fishermen and travelers that the Isle of Demons (located at the northern extremity of Newfoundland at the upper right of this map) was inhabited by bloodthirsty animals and evil spirits. Those who passed by the island told of hearing loud cries and the moaning of vicious beasts and tormented souls. In 1541 Jean-François de la Rocque, Sieur de Roberval, sailed on an expedition to New France accompanied by Marguerite de la Rocque, his niece. During the course of the voyage she became involved with a young officer, conduct that so enraged her uncle that he abandoned her, the young man, and the maid that had acted as go-between, on the Isle of Demons. Two

years later, a passing fishing boat rescued Marguerite, but her maid, her lover, and the child she had borne had all died. Marguerite returned to France and told of protecting herself against demons and monsters by reading the New Testament and fending off wild animals with a gun.

It has been suggested that the Isle of Demons was actually one of the seabird rookeries off the coast of Newfoundland. When nesting, the usually silent birds make the sorts of sounds described by early travelers.

16.

Americae Sive Novi Orbis, Nova Descriptio. In: Abraham Otrelius, THEATRUM ORBIS TERRARUM. Amsterdam, 1574.

Abraham Ortelius, called by Mercator "the Ptolemy of our day," was the first to compile and publish a modern atlas—a systematic collection of maps of all parts of the world presented in a consistent format. As a cartographic editor he brought together the most authoritative maps he could find, and this map of the Americas displays a rapidly expanding knowledge of the New World. Nonetheless he

includes St. Brendan's island (at the lower left), the Isle of Demons, and the long-debated Frisland, Drogeo, & Icaria (at left center). Estotiland has been identified with Labrador.

III. Currents and Winds

The first two centuries of discovery produced much information about winds and currents in the world's oceans, but theories to explain them had hardly changed since Aristotle. Although the sixteenth century had seen important developments in astronomy, anatomy, and botany there was no similar progress in the study of the atmosphere or the ocean. With the growth of colonial empires and maritime trade, seamen were collecting more and more data for the speculation of natural philosophers, and the chief characteristic of the literature in the second half of the seventeenth century was its attempt to deal more directly with the experience of mariners.

17.

Tabula geographico-hydrographica motus oceani. In: Athanasius Kircher, MUNDUS SUBTERRANEUS. Amsterdam, 1678.

In Greek legend, all the rivers of the earth issued from the mythical *Oceanus* through subterranean connections.

The title of this book refers to the Jesuit geographer Athanasius Kircher's hypothesis that a worldwide system of underground canals and reservoirs were connected to above-ground rivers and oceans. Shown here is the earliest printed thematic chart of currents in the open ocean. Although it is a landmark, Kircher's chart shows currents impossibly crossing at several points, and what seems to be a depiction of the Gulf Stream along the North American coast is probably a generalized illustration of his theory of water circulation.

18.

Isaac Vosius, A TREATISE CONCERNING THE MOTION OF THE SEAS AND WINDS. London, 1677.

Vosius's TREATISE was an important departure because he was not simply an "armchair" theorist, but instead based his work on actual observations by mariners: "Nor do I here alleadge any motion of the Seas and Winds, which I could not if it were necessary, confirm by infinite Testimonies and Experiences of Sea men." Here is the first demonstration of an understanding of ocean currents, a

phenomenon known since Columbus made use of them to return from the Indies, but never before explained. In simple words, Vosius correctly stated the basic theory of global water circulation: "That all the Waters of the Ocean turn round in a Circle, and return to the same point from whence they came."

19.

[Benjamin Franklin, COURSE OF THE GULF STREAM.] Paris, [ca. 1778.]

By the eighteenth century the southern part of the Gulf Stream (often called the Florida Current) had long been noted by mariners. Its northern extent, however, seems to have been less well-known. In 1767, when Benjamin Franklin was in London as Deputy Postmaster General, he was asked to investigate the fact that slower merchant vessels sailing from Rhode Island to London arrived two weeks sooner than the faster packet ships that sailed from New York to Falmouth. Franklin consulted Captain Timothy Folger from Nantucket who told him about the effects of the Gulf Stream and marked its extent and velocity on a

chart. He also explained that its characteristics were well-understood by New England whalers who found good hunting along its edges, but that many European and British captains appeared ignorent of its path and were sometimes observed sailing backwards, unaware that they were being carried in reverse by the strong current. The chart shown here was probably issued about 1778 in support of the packet boat service initiated between New York and Lorient, France.

[*Chart of the eastern Mediterranean*] From: Marco Francesco Gisolfo, [PORTOLAN ATLAS.] Genoa, [ca. 1565].

Wind directions were important not only for sailing, but also as an indicator of direction. In the Mediterranean for instance, winds were constant according to the season. The gold "rose" at the lower left of this portolan chart is labeled for wind directions, not compass points—clockwise: tramontana, graeco, levante, siroco, ostro, garbin, ponente, and maistro.

21.

[*Clouds*] In: Ralph Bohun, A DISCOURSE CONCERNING THE ORIGINE AND PROPERTIES OF WIND. Oxford, 1671.

Bohun stated that his intention was to compare the observations of seamen with the writings of the philosophers in order "to arrive at a more perfect History of Winds." Nonetheless, he forced observed nature into traditional categories. The oblique motion of the winds he ascribed to various causes, among which were the energy of angels, the influx of divine power, and the breathing of the earth. In conclusion he stated that "the causes of the Winds are various." But he did suggest the systematic collection of information about winds in order to assist navigation, a project that was brought to fruition by Matthew Fontaine Maury in the nineteenth century.

22.

A view of the general & coasting Trade-Winds in the Atlantick & Indian Oceans. In: William Dampier, A COLLECTION OF VOYAGES, v. 2. London, 1729.

23.

Representation du cours ordinaire des vents de traverse qui regnent sur les Cotes dans la grande Mer du Sud. In: William Dampier, SUITE DU VOYAGE AUTOUR DU MONDE, v.2. Amsterdam, 1701.

William Dampier is best remembered as a buccaneer who circumnavigated the globe in the course of his adventures. But on his voyages he also took careful note of geographical data and information about winds, tides, and currents. An effective writer as well, his treatise on winds remains authoritative today. Dampier's practical experience combined with the theoretical works of Isaac Vossius (No. 18) and Edmond Halley provided the general patterns for oceanic wind systems that appeared on many charts and globes after 1700.

IV. Longitude

The problem of determining longitude—the number of degrees east or west of an arbitrary north/south line on the earth's surface, called a meridian—frustrated mariners and scientists until the middle of the eighteenth century. Samuel Champlain recorded his conviction that God did not intend that a man should be able to determine longitude at sea, while Sebastian Cabot confided on his deathbead that he had acquired that knowledge by divine revelation but was not permitted to share it. As early as 1598 Philip II of Spain offered a cash reward to the discoverer of a method for determining longitude, and in 1714 (after a series of maritime disasters) Great Britain offered a L20,000 prize for the solution.

A time-based theory had been proposed by the mathematician Gemma Frisius in 1590, and cartographers were aware that in principle any fast moving astronomical body could be used as the basis for timekeeping provided that its motion could be predicted and observed. The moon and the eclipses of Jupiter's satellites were used for this pur-

pose, but calculations were complicated and not always successful. It was not until 1761 that the English clockmaker John Harrison developed a timepiece—clock "No. 4"—that kept accurate enough time on a sea voyage to determine longitude with an error of less than one geographical mile. Eleven years later, after the intercession of King George III, Harrison finally received his prize. Captain James Cook carried versions of Harrison's chronometer on his second (1772-1775) and third (1776-1780) voyages; the charts that he made were the first in the history of exploration to be based upon relatively accurate longitude observations.

24.

[Bradock Mead, alias] John Green, REMARKS, IN SUPPORT OF THE NEW CHART OF NORTH AND SOUTH AMERICA. London, 1753.

25.

Chart comprizing Greenland with the Countries and Islands about Baffin's and Hudson's Bay. Sheet II of [Bradock Mead, alias John Green], A CHART OF NORTH AND SOUTH AMERICA. [London,] 1753.

As attempts were being made to solve the problem of finding longitude at sea, cartographers such as Bradock Mead (alias John Green as a result of troubles with the law in his native Ireland) focused on providing more accurate charts based upon the few coordinates of latitude and longitude that had been determined by observation. These he supplemented by wide-ranging research into printed and manuscript charts from as many sources as he could find. He explained his method and sources in his printed REMARKS as well as in the detailed notes on the face of his charts, sometimes haranguing and sometimes encouraging a dialogue with mariners and other chartmakers.

V. Magnetic Variation

It had long been noted by mariners that the compass did not point to true north and that this deviation was not the same from place to place, or even in one place from year to year. Beginning about 1500 some chartmakers began to note these differences, often by showing the compass needle pointing some degrees away from true north. In 1536 a map was displayed at a meeting of Spanish pilots in Seville that pointed out three locations where declination had been satisfactorily determined. However, it was not until Edmond Halley returned from his extensive scientific voyages in the South Atlantic in 1698-1699 that the world-wide pattern of magnetic variation was systematically illustrated on a published chart, and his chart of the North and South Atlantic (1701) was the first clear use of isogones (lines that connect points with the same magnetic variation). A year later he published the chart shown here, which extended the readings to the Indian Ocean. Halley had hoped that an understanding of variation would lead to a solution of the problem of determining longitude at sea, but in that he was unsuccessful.

26.

Edmond Halley, NOVA & ACCURATISSIMA TOTIUS TERRARUM ORBIS TABULA NAUTICA VARIATIONUM MAGNETICARUM INDEX JUXTA OBSERVATIONES ANNO. 1700. London, [ca. 1702].

VI. The Mercator Chart

The traditional plane chart treated the earth as if it were flat rather than as a curved surface flattened onto a plane—it was not drawn to a mathematical projection and took no account of the convergance of the meridians towards the poles. For short stretches of coast the method worked well enough, but when larger areas of the globe were covered the errors increased in such a degree as to make these charts all but useless. In 1569 the Dutch geographer Gerard Mercator published a world map on a new projection that overcame many of the problems of the plane chart and enabled a mariner to plot a course with a straight line, which had not been possible before. But despite its advantages, Mercator's projection was not readily adopted because the mathematics were so little understood. Even after the mathematician, Edward Wright, gave instructions for its construction, few cartographers attempted to use it for the small-area sectional maps that were employed in the course of daily business.

27.

Edward Wright, CERTAINE ERRORS IN NAVIGATION. London, 1599.

28.

Edward Wright, *[Map of the World, Western Hemisphere].* In: Richard Hakluyt, PRINCIPAL NAVIGATIONS OF THE ENGLISH NATION. London, 1598-1600.

In 1589, the English mathematician Edward Wright suffered through a passage to the Azores on a ship that had strayed far off her course because of the unreliability of the plane charts being used by the ship's captain and pilot. As a result, he set himself the task of improving the reliability of open-sea navigation, and in 1599 his calculations and revisions found their way into print in the pioneering work, CERTAINE ERRORS IN NAVIGATION. Especially important was the fact that Wright provided detailed instructions for the construction of charts using Mercator's projection, something that the Dutch geographer had left unexplained. A year later, Richard Hakluyt included in his influential work a world map drawn on the Mercator

projection from Wright's instructions, the first since Mercator's own world map had appeared thirty years before.

29.

Carta Secunda Generale del' America. Sir Robert Dudley, ARCANO DELL'MARE. Florence, 1646.

Sir Robert Dudley, son of Queen Elizabeth's lover, the Duke of Leicester, left England in 1605 to make his fortune in Florence, where he served as engineer to the Grand Duke of Tuscany. One of his projects was the production of a comprehensive sea atlas, the first edition of which was published in 1646. This was the first atlas to have all the charts drawn on the Mercator projection, and the inclusion of soundings, figures for magnetic variation, and notes on currents made it the outstanding work of its day. However, it never became widely known and its influence on contemporary and later hydrographic charting was limited.

30.

*[Carolina from Roanoke River to below Hilton Hea*d].

From: THE BLATHWAYT ATLAS, assembled ca. 1683.

In 1696, over a century after the invention of the Mercator projection, an irritated Edmond Halley wrote to his friend, Samuel Pepys, decrying the primitive state of English navigation. On the subject of the legendary conservatism of mariners he bemoaned "how tenaciously or rather obstinately they resolve to make use of no other than the Common Plain Chart as if the earth were flat, when at the same time they all know and allow that they sail on a Globe, and they content themselves that those that knew no more have yet brought their ships home safe. Whence they conclude that any further Art, as they calle it, is superfluous."

Shown here is a plane chart made by a practitioner from the "Thames School" of chartmakers, who were active in London from the early seventeenth to the final quarter of the eighteenth century.

VII. Charting the Coastlines

The navigator plotted a ship's course out of sight of land on an ocean voyage, but at landfall the pilot had to know the coast he had encountered, for unknown shorelines with uncharted currents, shoals, and reefs, were more dangerous to a seaman than an unknown ocean. Over the course of centuries a body of information grew to help pilots with their task, consisting of views or "profiles" of the coast as seen from a ship at sea, written sailing directions, and coastal charts that showed soundings and navigational hazards. The form and content of these aids were fixed early and have changed very little in the past five centuries. Considering the seaborne nature of the European encounter with North and South America, it is plain that coastal charts had an important place in the "tool kit" of European expansion.

31.

QUESTA E UNA OPERA NECESSARIA A TUTTI LI NAVIGATIONE CHI VANO IN DIVERSE PARTE DEL MONDO. Venice: B. Rizo, 1490.

The *Portolano Rizo*, covering the Mediterranean Sea and the western coast of Europe, is the first book of sailing directions to be printed and the ancestor of the coast pilots and books of sailing directions still in use today. Developed from a long line of sailing directions dating from before the Christian era, it summarizes the experiences of many sailors on uncounted voyages.

32.

[Chart of the western Mediterranean.] From: Vesconte Maggiolo. [PORTOLAN ATLAS]. Naples, 1511.

Mediterranean books of sailing directions were often accompanied by charts that were designed to enable mariners to plan a voyage out of sight of land across what was essentially a tideless inland sea. All have sea areas drawn to scale to a remarkable degree of accuracy. Ports, anchorages, and headlands are identified along the coastline, while the more decorative "presentation copies" (such as the one shown here) are often embellished with landscape scenes and views of important cities.

33.

Nicolas Nicolay, sieur d'Arfeuille. LA NAVIGATION DU ROY D'ESCOSSE IACQUES CINQUIESME DU NOM, AUTOUR DE SON ROYAUME. Paris, 1583.

Sailors in northern waters, however, operated in a different environment of poor visibility, strong tides, and unreliable weather. For this reason they were slower to adopt the scale chart and relied primarily on pilot books that contained detailed written information for the coastal navigator, such as distances between prominent points of land, dangers to be avoided, and times and strength of the tides. They often included woodcut outlines that showed the shape of headlands and shore features. This pilot book describes the coast of Scotland.

34.

[Guadaloupe] and *[Martinique.]* Benedetto Bordone. LIBRO DI BENEDETTO BORDONE NEL QUAL SI RAGIONA DA TUTTE L'ISOLE DEL MONDO. Venice, 1528.

Bordone attempted to provide a sense of the geographical character of the islands in his *isolario* by filling the usually empty interiors with depictions of landscape characteristic of each place. But that was a far cry from the level of detail called for by the Englishman, William Bourne, in 1575. Scornful of the decorations that typically filled the empty spaces on charts, Bourne advocated the use those areas for the display of coastal views: "There is nothing more needful and necessary for seamen than this, to know the land when he seeth it, and there is no better way to make him remember it than to have notes on how the land doth rise on every side."

35.

The Sea Coastes of England betweene the Isle of Wight & Dover. Lucas Janszoon Waghenaer. THE MARINERS MIRROUR. London, 1588.

Waghenaer's *Spieghel der Zeevaerdt,* published in Leiden in 1584, brought coastal charts, views, and sailing directions together in a single volume for the first time. Although it was too costly for ordinary seamen, the worth

of this new approach was recognized immediately and four years later an unauthorized or "pirated" English edition was published in London. Thereafter, English sea atlases were commonly called "waggoners."

36.

THE ENGLISH PILOT. THE FOURTH BOOK. London, 1732.

English contributions to hydrographic publication lagged behind the Dutch until the late seventeenth century. The ENGLISH PILOT, published in four books covering different parts of the world, was the earliest of the commercial sea atlases. It was used regularly by the Royal Navy and the merchant marine until the Admiralty was established in 1795. It follows the "waggoner" format—charts supplemented by coastal views (here along the top edge), with sailing directions on the following page.

37.

A chart of the South Cape of New Holland. In: Benjamin Page, Jr., JOURNAL OF A VOYAGE TO CANTON AND

RETURN BY WAY OF AUSTRALIA, 1798-1799. Manuscript.

This is the journal of the maiden voyage of the Brown & Ives Ship *Ann and Hope* kept by the son of the ship's Master, Benjamin Page. The *Ann and Hope* was one of the first American vessels to trade with Australia, and Benjamin Jr. has drawn charts of the little-known coast to supplement his journal entries. In the age-old tradition of mariners he has especially focused his attention on providing views and profiles of the coastline and its headlands.

38.

Chart of the Coast of America from George's Bank to Rhode Island including Nantucket Shoals &c. from the latest Surveys. From: Matthew Clark, [THE AMERICAN PILOT.] Boston, 1790.

American seamen were well-served by the navigational information from personal observation that they recorded in their log books and journals. Until the end of the eighteenth century American seamen were dependent upon the fourth book of the ENGLISH PILOT for printed

charts and sailing directions of the coasts of North America and the West Indies, where so much trade activity was directed. In 1790 Matthew Clark of Boston, an auctioneer by trade, met this need with his AMERICAN PILOT, an unassuming looking production that was immediately copied and regularly re-issued in edition after edition. Clark's maps were based upon British models, and there was barely one page of sailing directions for the entire coast of North America and the Caribbean, but his chart of the hazards of the Nantucket shoals was an original, and valuable, American contribution.

II. Water Roads to the Interior

Europeans were always on the lookout for navigable water to provide access to the interior, and the charts they drew of American rivers and bays were, in effect, "road maps" to places it might have been difficult or impossible to reach by land.

The manuscript map of Surinam (No. 39) shows estates following the course of the rivers, and it is plain that without the river the interior of that tropical colony would have been all but inaccessible.

The Saint Lawrence River (No. 40) allowed French explorers to penetrate to the middle of the North American continent well before any land road had been developed to support the westward movement of European adventurers and settlers.

The manuscript map of Maryland (No. 41) focuses upon the Chesapeake Bay, which made scattered settlements accessible enough to ships so that planters did not have to bring their crops to central markets, incidentally hindering the development of cities in tidewater Virginia and Maryland.

The first printed map of Rhode Island (No. 41*) is actually a chart of Narragansett Bay, which underlines the colonial focus on the water for daily transportation and mercantile activity. The Rhode Island hinterland did not become commercially viable until the invention of the steam engine brought the industrial revolution to the rivers and streams of rural New England in the early nineteenth century.

* Because of the large size of the Blaskowitz chart of Narragansett Bay (1777), we have used for display a reduced French version published in 1780.

39.

[SURINAM AND COMMEWIJNE RIVERS. 1667 or later.] Manuscript.

40.

LE CANADA FAICT PAR LE SIEUR DE CHAMPLAIN. Paris, [ca. 1669].

41.

MARYLAND. CA. 1677.] Manuscript.

42.

Charles Blaskowitz, PLAN DE LA BAIE DE NARRAGANSETT DANS LA NOUVELLE ANGLETERRE. [Paris,] 1780.

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